

Second Part
OF A
REPORT
ON THE
Proposed Navigation
BETWEEN THE
EAST *and* WEST SEAS,
VIZ. FROM
HAYDON-BRIDGE,
TO
MARYPORT;
WITH
OBSERVATIONS ON LINES
TO
Penrith, Sandsfield, Ravensbank, Bowness,
Wigton, &c.

BY WILLIAM CHAPMAN ENGINEER, M. R. I. A.

NEWCASTLE,
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LATELY PUBLISHED,
THE
FIRST PART
OF A
REPORT
ON THE
PROPOSED NAVIGATION
BETWEEN THE
EAST AND WEST SEAS,
SO FAR AS EXTENDS FROM
NEWCASTLE to HAYDON-BRIDGE,
WITH
OBSERVATIONS ON THE SEPARATE ADVANTAGES
OF THE
North and South Sides of the River Tyne.

BY WILLIAM CHAPMAN, ENGINEER, M. R. I. A.

NEWCASTLE:

Printed by J. WHITFIELD, Bookseller, Bridge-end,
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1795.

GENTLEMEN,

HAVING already described the line from Newcastle to Haydon Bridge; I shall now (deferring any further observations on that part, until I have surveyed the southern side of the Tyne) proceed to give an account of its progress westward; which cannot be essentially altered, by the future adoption of one side or the other; because the course on the south side of the river must, be finally, if not sooner, terminated by the high Scar between Haydon Bridge and the foot of the Allen.

The northern line, on the level of Newcastle, meeting with the river Tyne at Haydon Bridge, it thence-forward becomes necessary to rise, until the summit be attained: and no particular advantage, as to future extension, being capable of being acquired*, by retaining the height of the summit, or any fixed elevation;

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* Vide first part of this Report, page 18, line 4 from bottom,

the chief object of choice left, was to find ground most suitable for a Canal ; in attending to which, I have occasionally adverted to the having *many locks near together* ; because, in this instance, a lock-keeper may look after more locks than one ; and should any accident happen, to any of the intermediate locks, they are capable of being, almost instantly, laid dry by the running off a short level of the Canal ; and repaired, without material interruption, to such part of the trade as requires quick dispatch ; as the articles under this predicament are easily conveyed from one boat to another, when only separated by a short space between two locks.

The lowest summit, between the two seas, lies in the vale between the rivers Irthing and Tipple ; but as it was the opinion of several gentlemen, that a better line existed between Hartley Burn and Talkin Tarne ; I surveyed so much of it, as to put the eligibility of the former beyond a doubt. In this instance, as in many others, in the great extent between the two seas, lines, I thought ineligible, were more or less surveyed :—because of the necessity I found, of adducing facts in favour of arguments, that could otherwise only be supported by strong probability. The time and expence however was, in this instance,

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as well in some others, far from being lost; as various facts not unuseful to be known, were by this means acquired.

In my first Report, I suggested the probability of a line from the summit level at Glenwhelt, running pretty far up the South Tyne, perhaps, to between Knarefdale and Kirkhaugh.—This was done on the principle, that rivulets have, *in general*, much greater declivity in their beds, than the rivers they fall into.

The survey proved the Tipple, so far as its course is followed by the line of the proposed Canal, to be one of the exceptions; as the level of the summit, which is about 65 feet above the junction of the Tipple with the Tyne, is surmounted by the latter river, a little above where it is joined by Hartley Burn: consequently, exclusive of the ground itself being unsuitable, on account of many scars, or precipices; that circumstance alone, of the rapid rise of the Tyne, precludes the line suggested.—To answer effectually the main object of that survey, I went up the course of Hartley Burn, nearly half-way to Tendale Tarne, and in that space, it rose upwards of one hundred feet.

The propriety of the summit, between Glenwhelt and the Irthing, being now indubitably
— fixed;

fixed ; I shall point out the course of the line from Haydon Bridge, as laid out on the principles I have mentioned.

An ascent of about sixty-three feet, by seven locks, in nearly half a mile, brings the line up to an inclined plane ; lying above the brow of the rising ground immediately north of the high road to Haltwessel, and below the declivity of the higher land extending above it. About two miles from Haydon Bridge, the high road passes a rivulet ; and in the S. E. angle between them there is a lime kiln ; just within which, the described level of Canal will pass ; and after occupying the scite of the road (a little further north) above the scar, will go to the east of the house on the road side.—A little further, after passing a small stream, it meets with unfavourable and steep ground, too high to be got above, without encountering great difficulties from numerous ravines ; and at the brow of the bank, about a quarter of a mile short of the river Allen, it commences a quick rise of about thirty-seven feet ; and then will, probably*, continue south
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* I cannot determine positively, either here or in many other places, because, in the *first survey* of a country, there is nothing to direct but *probabilities* ; and (when even conducted with the greatest judgement and

of the high road, until past Barden Mills; after which, a further rise of about forty feet, by four locks, will become requisite, to avoid the scars of To-House; and the high road will be again passed, in the valley, north of the hills on the river side, east of To-House; immediately beyond which, the line returns south of the road; and passing considerably below Hard-Riding, and just above Wood-Hall; surmounts, with very little extra-cutting, the scar between there and Milkridge, where the river and high road approach each other:—then, passing south of Milkridge, on the verge of the low ground, it draws near to the Tyne, at a dismantled brewery; near where the new and old roads to Haltwessel separate, the former to pass under the precipice, and the latter over the hills. Here, close beyond the brewery, it becomes necessary to rise one lock, and, for about 200 yards, there is some difficulty, from a part of the precipice lying below the road; which however is of less moment, as the stone rises easily, and will be wanted for the locks in the vicinity. In the course of the high road under the precipice, there is a small rivulet

on the surest principles), circumstances that can only be ascertained by the progress of the survey, often defeat the eligibility of a portion of the line examined, and leave the intervening parts to be judged of with more or less uncertainty.

let from between the hills; and here the difficulty ceases:—the line will then occupy the site of the road for near a quarter of a mile, and passing straight forward, to the southward of the mill which stands south of the road, will require a second lock, previously to the passing of Haltwessel Burn, which will carry the line to the foot of the hill, south of the church. Part of these two last levels, which are each about half a mile long, is on ground occasionally flooded; but, in these parts, the Canal will be in embankment, and may be raised sufficiently out of the reach of the floods.

From below Haltwessel Church, the line will run south of the high road; and a little beyond where the road turns suddenly off to the north, to ascend towards the military road, will cross a rivulet; and enter the vale of the Tipple: at this place, by a rise of eight locks, in the space described, the summit level, of about two hundred and forty feet above Newcastle, may be acquired. It then will run north of the house of Dryburn Haugh, and onwards, without material impediment to Glenwhelt; where it might pass below the inn, were it not for the extreme difficulty of managing the approaches to the bridge which would be necessary for passing over the Canal, and which would

would have to rise about eight feet above the parapet of the adjoining bridge over the Tipple; therefore, to get quit of this inconvenience, it will be necessary, unless a turning bridge be allowed, to go so much further into the bank as to pass under the inn itself, which, as it is seated on rock, may be done without destroying the house.

The river Tipple, which will be passed over, a little below Thirlewall Castle, may with ease be taken in to supply * the water consumed towards both seas: and the Canal, in its further progress through this narrow vale, which fortunately affords it a passage, has only a moderate rise of ground to encounter.

In forming a passage between any two points, where an intermediate part is considerably higher than the extremities, it follows, that by sinking a portion of that space deeper than the necessary channel, by the height of fall of one or more locks, that twice that number of locks will be saved; and, frequently, water obtained that could not be had on higher levels. The latter, however, is not the case here; but the former may be advantageously attended

* Besides which, there are other supplies in this vale more than adequate to the purpose.

ed to, because the ridge of the summit between the Tipple and the Irthing happens to be, to a great depth, a drained or cultivated bog, which may be easily excavated. From these causes, I surveyed the line of summit level, eighteen feet, under the summit of the bog, (or twelve feet on an average, for three quarters of a mile.)

About a quarter of a mile short of the river Irthing, opposite half-way between Orchard House and the Shaws, the Canal gets out of ground, and turns downwards, nearly parallel to the river, so as to pass Poultrofs Burn, a little above the mill, near Mups Hall:—the course of the line, then, because of the banks of the Irthing being steep and rugged, lies up a narrow vale between two ridges of high ground, in which it crosses the road from Mups Hall to upper Denton, about half a mile from the latter place. At and near the crossing of the road, there will be, *for about a quarter of a mile*, as much depth of cutting as between the Irthing and Tipple; and should this, on examination, prove very difficult, it may be necessary to raise the summit a few feet higher, or so far at least, as it may not be counterballanced by other difficulties in the necessary continuation of that level. After crossing
the

the road to upper Denton, the course is down a small dean towards the river, and the ground quickly falls to the level of the Canal; which, after skirting above the rocky precipice over the Irthing, runs close to the north of the church of the last mentioned village; and, at the distance of three furlongs to the westward, re-crosses the high road; and, passing a rivulet, runs for a while at the foot, and then on the face of the range of hills to the south of Low Denton until that range ceases, nearly half a mile west of that village; then the line runs southward to within Lower Cleugh Head; and passing westward, to the south of Beckstone Gate and Denton Hall, it skirts along the face of the rising ground, north of the military road, until half a mile west of the road to Naworth Castle; where, not far from the eleventh mile stone from Carlisle, it crosses to the southward.—In its course thus far, it approaches within eighty yards of the military road, below the gate leading to Naworth Castle; and as it was necessary, if possible, to avoid coming into any part of the demain; I tried various lines to avoid it; but all to no purpose, as every one was attended with a great extent of deep cutting; and even in the line that must, if any be carried into effect, be adopted; some inconvenience will arise for upwards of half a mile,

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from

from the steepness of the banks, and sandiness of the soil.

After passing the military road, the line runs tolerably straight towards the Mill below Milltown Beck House; and, after crossing the rivulet, a little above the mill, the summit level quickly ceases to lie in a proper course for the continuation towards Carlisle; and here, after running eleven miles and a half without a lock, it becomes necessary to descend towards the Western Sea. At this place, the ground towards almost every quarter, assumes an appearance as irregular as the surface of the the ocean, after storms in different directions: from which cause, and still more so, from the ridges of high land, far above the level, lying between Hell Beck and the river Gelt, and on the west side of the latter river projecting nearly as far as Hayton; it appeared extremely dubious whether the height of the summit could be carried forward towards Penrith, without either encountering too much circuitry, or difficulties next to insuperable. I therefore, as no inconsiderable portion of future revenue might arise from that line, tried the practicability of it, through these difficulties; and beyond my expectation, and contrary to what appearances promised, I found the summit level might be continued in the following course:

course, (from the point of *separation to Carlisle*, about three hundred yards S. W. of the road from Milltown to Brampton) viz. in a line near the foot of the hills west of Talkin Tarne; and about eighteen feet above the level of the lake. It then, opposite Tarn-end House, turns up the east side of a deep cavity, between Talkin and Netherton; and, after passing the high road between these places, encounters about twenty-five feet depth of cutting, but only for about two hundred and fifty yards, before it passes into the Vale of the Gelt: and then, running southward up its eastern side, to pass the narrow bridge on the road from Talkin to Castle Carrick, it crosses the Gelt where it runs between two precipices; and advancing to nearly within one hundred yards of the north end of Castle Carrick, it goes westward, over a narrow ridge of rising ground, into the Common; from whence, through an opening of low land, it passes the high road from Brampton to Penrith, about a quarter of a mile south of Castle Carrick Tarne; and thus gets clear of all the difficulties I mentioned.

From the abundance of lime close to Castle Carrick; and the vicinity of coals to various parts of the main line; a great deal of carriage must arise on this projected branch; exclusive

of what may be expected from flates, and from the usual articles of produce and commerce of the country.—Many gentlemen having entertained an idea that the proper line of any future communication with Penrith and the county southward, should be up the vale of Pettril; it may not be unnessary to make one observation to shew the inexpediency of it.—The part of the main line from which this branch would have to rise, would, of course, be west of the river Eden.—Now, the highest level after crossing that river towards Carlisle, is three hundred and seventy feet, or more, below the summit level; of *which* the branch I have recommended is a *continuation*: and therefore, to re-attain that height, a vast number of locks would have to be built; and water to be obtained to supply them:—and when done, no other purpose would be answered but this:—The line of communication to Carlisle and the westward would be shortened eight or nine miles; but the descent would be the same; and the communication to Newcastle would be lengthened about as much, with the further inconvenience of coming three hundred and seventy feet down-hill, for the purpose of going three hundred and seventy feet up again.—The deduction is obvious; and the idea of going up the Pettril would not have

have deserved a refutation, were it not that in the infancy of knowledge of every kind, the grossest and most absurd doctrines, when propagated with confidence, meet with many believers; which has rendered it necessary for me to speak to various points that I would not have noticed where Canals or interior Navigations were in any degree made use of.

Before I return to the description of the main line from where I left it off, (on the point of descent towards the west sea) I shall observe, that from thence a branch on the summit level may be continued towards the collieries of Tendale Fell, to within a quarter of a mile of Kirkhouse; where a rail way may conveniently communicate.—This branch would be less than a mile; and a small portion of it would be a part of the line towards Penrith.

From the point of separation, already described, the western descent begins; and the course of the line lies in the vale to the northward of the old Carlisle road; and requires a *descent of about fifty seven feet* in less than three quarters of a mile. On *this level* the line crosses, nearly a mile south of Brampton, on the road from thence to Penrith, close to the house of Hollas, and north of the Little Tarne in the bog; from this place a vale runs northward,
through

through which a small rivulet runs to Brampton; and, on the east side of this vale, a branch* from the level last mentioned, may be continued a part of the way towards the town, if found necessary or expedient.

The line from Hollas House, runs close to the southward, and at the foot, of a remarkable peak, like a sugar loaf; and, there, immediately, begins a rapid descent towards Gelt Bridge; falling one hundred and ninety six feet in barely a mile; so that the locks will be crowded so nearly together, as to require a great increase of width of Canal to enable each lock to be fill'd without materially drawing down the level above it.—Fortunately this staircase of locks, at about half way down, passes within half a mile of the great quarriest† on the Gelt; and

* It is probable, that from some lower level, a line passing not far from the Capon Tree, may be continued to near the west end of Brampton.

† The Quarries of Gelt are of a reddish grit, rising in regular strata of various thicknesses, from that of a thin flag to upwards of a foot. They will afford a considerable article of commerce: and easily communicate with the Canal at the foot of the great train of locks, just below Gelt Bridge, by means of a rail way along the verge of the river, under the precipices, which will become one continued quarry for the whole distance. The conveyance of this article towards Carlisle, and westward, will consume a great deal of water: and therefore, to avoid an unnecessary current along the Canal, from the summit sources, to supply both this demand, and others from partial conveyance below this level,

and stone of course will be had for them at a very cheap rate.—It crosses the road to the quarries just where a small stream begins to run in a deep hollow, in which it continues its course to the Gelt, a little above the bridge.—This valley (until within two hundred yards of the Gelt where it takes an improper course) is ready form'd by nature for a Canal, and requires only the locks to be built; by which would be saved a great deal of excavation in a loose sandy soil, that would be expensive to make staunch.—It forms an angle, in its course, so as to lengthen the line about fifty yards; which in the present instance, of rather too contracted a space for the locks, is of no detriment.

After passing the river, just below Gelt Bridge, the line runs close to the north of the road to Warwick Bridge, until it quits the common; from whence, because of a ridge of rising ground, it gradually advances near two hundred yards north of the high road, until the ground admits its turning south, which it does with a considerable angle; and after falling a lock, near *the road* to Warwick Bridge, crosses

it will be advisable to take in part of the Gelt; which may be done without expence for the water, as there are no mills on the lower part of this river,

crosses it, a little more than half way between the Common-Gate and the place where the roads strike off to Haydon, and to Edmond Castle: then, keeping the south side of Bygill, and Low Moor, it continues westward above the low ground; and takes its course, by Corby New Hall, to the banks of the Eden; about a quarter of a mile above where it is joined by the Irthing.

In its course, thus far, from Gelt Bridge, it falls about one hundred and twenty-one feet; which brings it down to the highest level that Carlisle can conveniently be approached upon, (viz.) about three hundred and seventy four feet below the summit.

The river Eden, in this part, runs over a bed of rock; and should be passed where least expensive, (viz.) where the banks are of the most convenient height; and the bottom the levellest, and most accessible. Regard also should be had to keeping as clear as may be of Mr Warwick's improved grounds.

The usual surface of the river, will only be about twenty-three feet under the surface of the Canal; and therefore, as the arches would be small, and many of them required, it may be necessary to cross upon a higher level, and
lock

lock down at the west end of the aqueduct; although attended with considerable expence of embankment, on the eastern approach, but this must depend on an accurate and minute examination of the bed and shores of the river; and, at all events, the Eden will be passed here, the most advantageously, and at a comparatively moderate charge.

* In my first report I mentioned that "Carlisle should be approached on as high a level as possible; which, if particular circumstances did not prevent, would be on the Brow of Stanwix Hill; from whence it might continue down the Eden-side to where the shores on both sides were highest; and suited to pass with a considerable elevation above the sea." Stanwix Bank, undoubtedly, offered the highest approach to the town; and, as such, although attended with perhaps counterbalancing inconveniences, had its peculiar advantages; but, on going further down the banks of the Eden, I found no place where its high shores approached, near to each other, so as to afford a pass on a level sufficiently high to penetrate to the south west:—therefore I turned my attention, solely, to such a

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line, on the south side, as would approach nearest to Carlisle, situated as it is on an insular piece of high land, in the midst of the marshes of the Eden, the Caldew, and Pettril.—The scite of Carlisle has no connexion with any other elevated ground, but by a narrow isthmus between the Citadel and St Nicholas, and on the west side of Botchergate; this isthmus, though rather low, was capable of admitting, with some embankment, a Canal to be carried upon it, *on the level of the base of the wall, on the west side of the fosse of the Citadel*; which, of course, I assumed as a fixed point, to decide more or less as to distance, the continuation of the line on each side of Carlisle; and finding that the river Eden could be crossed on the level of one lock higher, I tried the continuance of that height to the westward, *to see if it would sooner lead out of the vale of the Eden*; but, after examining several ways, I found it practicable no other way, than by the valley between Monkhill and Kirkandrews; which, as it was likewise practicable by the latter, with only a moderate increase of distance, such as was more than compensated for by the non-necessity of a lock on the Carlisle branch; I adopted the level I have mentioned (of the foot of the wall west of the Citadel fosse) which, as before intimated, is about three hundred and seventy four

four feet below the level of the summit; the same as on passing the Eden.

The Line on this level, from the Eden, runs about a quarter of a mile north of Aglionby; and in front of the rising grounds of Wheelbarrow Hall, Durnhill, and Harraby:*—and crossing the Pettril, below the bridge on the high road to Penrith. it passes, on the west side of Harraby Hill, to the front of the high ground above the house of St Nicholas.—In the line thus far from the crossing of the Eden; there are three short pieces of rather high embankment, on crossing the flat grounds that separate the rising lands of Aglionby, Wheelbarrow Hall, Durnhill, and Harraby.

The line from St Nicholas to Carlisle, I have already described. Its length is rather less than half a mile; and it may either terminate in a basin south of the Cross-Houses at the head of Botchergate; or in the fosse of the Citadel, from whence it might, if necessary, be continued a little† way into the fields east of the Drovers Lane.—Either of these terminations, I conceive, would be very convenient

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* Consequently south of Botcherby.

† Not far, because of descent of the ground.

for the city of Carlisle.—And, as to endeavouring to promote its advantages further; by passing in front of the walls of the Town, and crossing the Caldew from the foot of the Castle; the idea could only originate from inattention to the face of the country westward; or ignorance of its effects.—Carlisle, as already noticed, is seated on rising ground in the midst of marshes, at the confluence of three rivers.

The low land from the castle, across the Caldew, is, I suppose, not five* feet higher than the haughs about half a mile lower down; and, on this supposition, about thirty five feet below the Carlisle level of Canal; *any thing near to which*, would be absurd to think of carrying a level upon, unless for a very short space, and compelled by necessity; and, were the Canal to pass along the northern face of the city and across the Haughs of Caldew, *at any reasonable height*; insuperable impediments oppose its progress,

The river Eden runs to Solway Firth through a vale of flat ground, bound by rising lands; and, in its course, is reflected from shore to shore of this vale, so as alternately to form
steep

* This allowance is more than double the average fall of the river from Warwick.

steep and lofty scars, on each side, *too high to be got above for the continuance of the level*; and (setting aside all idea of retaining height, and proceeding to Maryport), *too expensive to be passed in the face of so large a river*. From this cause, it is, also, ineligible to carry into effect, another plan that demanded some attention: (viz.) “the making a Navigation from Solway Firth to Carlisle for sea vessels of eighty or one hundred tons, either through the haughs, or in the river, as circumstances might point out; much of which, would depend on how far the navigation of the Firth could be easily improved; and on the fall of the Eden below Carlisle.”*

The navigation to the head of the Firth, is not well suited for vessels, above forty or fifty tons; nor could it be easily improved:—but as the surface of the haughs below Caldew, near the foot of the castle, are less than twenty feet above high spring tides, a Navigation for such vessels, before-described, as calculated for coming from the sea up the Firth (which might carry sixty tons on a suitable construction), could easily have been made; *had there been a regular continuation of haugh on either shore*. And, as to the river itself, although the rise in summer,

water

water is little more than twelve feet above high spring tides, it would be attended with too much expence and difficulty to make it answer any purpose.

Having now mentioned the impediments to proceeding with the Canal under the walls of Carlisle; I shall return to the description of *the practicable course of it.*

From St Nicholas, on the same level as from Warwick, the line runs on the face of the declining ground, to the north of the high ground, west of Cuddick; from which it crosses the vale, in its narrowest part, to a projecting point of land, just opposite a mill weir on the Caldew. The average embankment is here about twelve or thirteen feet; and for an extent of three hundred yards.— From thence, it passes in nearly a straight line (with some deep sinking to the Dalston road, and embankment over the low ground north of it), to within three hundred yards west of the separation of the roads from Caldew Gate, to Thursby, and to Newtown: and, here, to avoid a circuit of about two miles, by the Canal, to the Citadel; and to answer the purpose of the north-west part of the city, a Basin may be formed. From hence, by an embankment of about sixteen feet, the line will

will pass towards the lower part of the high land east of Newtown; and cross to the north side of that hill, towards the river Eden;—and, after leaving Newtown and Knockupwards, on the left, and passing to the eastward of the hill north of the latter place; it will cross to the west of the high road from Newtown to Kirkandrews; near to where the road strikes off to Grinsdale. From thence, leaving Millbeck Mill and Kirkandrews on the right; it will, after some deep cutting, to avoid a circuit round the east end of the hill north of Kirkandrews, pass over into the vale between there and Monkhill:—then, crossing over, past the S.W. end of the ridge of Monkhill (which extends north-eastward to Beaumont, and down the Eden-side, forming a high scar), it leaves Burgh-Mill Tarne, about two hundred yards to the right; and going straight across a hollow in the ridge of high land between the two branches of Sandsfield Beck; it passes up the vale of the western branch (which runs from Moorhouse Mill) until the vale rises and becomes contracted; opposite a hollow between two hills, which leads to the head of the marshy ground, north of Thrustinfield:—and, here, for reasons that will be shortly mentioned, the Canal may fall one lock. Having brought the Carlisle level

to

to this point, I will stop to discuss whether any advantage could be acquired by keeping *one lock lower at Carlisle*, (for, *two are perfectly out of the question*).

The advantage expected from keeping lower, is the skirting a larger portion of the city; and crossing the Caldew, lower down, so as to make, what would otherwise be, the Carlisle branch, a part of the main line of Navigation; and, at the same time, shorten the distance, by crossing more directly towards the high land east of Newtown road.—This, I have already observed, can not be, without a considerable embankment between the castle and that hill: and, if attempted higher up the Caldew, from the south end of the town; the vale is wide and still very deep; and no material advantage would be gained. On the west side of Carlisle, the wall occupies the verge of the hill; therefore, the line could not advance that way: and admitting the fields east of the Drovers Lane to be passed through, the higher land could be kept no longer, without destroying many buildings within the wall, above Rickergate; and onwards to the ditch of the castle, through which the Canal might be continued to its passage over the Caldew. But, when all the difficulties are considered

sidered in any of the points of view, they appear to over-balance the extent of advantage that is proposed to be gained.—The course, from opposite Newton, to the west branch of Sandsfield Beck, is rather circuitous *upon the level from Warwick*; and, *upon the level of one lock lower*, it would be still more so; from having to pass round the east point of the hill north of Kirkandrews, and, afterwards to return to the S. W. end of Monkhill; where the whole fall of the lock would have to be encountered in *extra cutting beyond the depth of the Canal*; and a still greater depth in passing over the ridge between the two branches of Sandsfield Beck; over which, *upon the level surveyed*, there is for some distance, nearly five feet extraordinary depth of cutting; which could not be avoided, without making a circuit to the eastward beyond Burgh Mill; which would be three quarters of a mile about; before it returned to the other side of the hollow over the ridge between the two branches of the rivulet.

Having now sufficiently explained the propriety of the level pursued; and the consequences of departing from it at Carlisle; I shall revert to where I left it, at the head of the marshy ground north of Thrustinfield:—from

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this place I tried the continuance of the same level ; and found it to pass close to the north of Kirkbanton, Longrigg, Plowlands, and Little-Banton;—from thence, turning away south, it became necessary to fall, previously to passing Banton-Beck.—I found that by going about a quarter of a mile more to the westward of Little-Banton, the line might turn south, *on a level two locks lower*; and finding, from the future progress of the survey, that no material inconvenience, as to increase of distance, would arise from the alteration ; I feel myself inclined to recommend the renouncing of the continuance of a long level from Carlisle ; in front of all these villages ; which would afford them the advantage of carrying their products to the city without the least interruption : because, this advantage will be more than counterbalanced by taking the Canal through the waste grounds, and commons ; in place of through innumerable fields, belonging to almost as many different proprietors ; and, also, because the whole ascent from Maryport will not be so considerable as to preclude a regular communication every market-day ; either to that town or Carlisle, from such part of the intervening country, as would go with their produce, or on their other avocations to either market.—By falling one lock in the flat ground north of Thrust-

Thrustinfield; and a second, after crossing the high road from Kirkbanton to Kirkbride, about half a mile westward of the former village, the valuable inclosed grounds will be avoided; and the line made as short as that admits of:—and, at the same time, the future communication with Ravensbank, or Bowness, will be facilitated as far as possible; by previously descending to the lowest level suitable for the continuance of the Canal.

I am far from saying that such communications either will, or are necessary to, be made: but, as there are advocates for one or other of these lines; it is necessary for me to say how far they are practicable.

The line, from this second lock below Carlisle to Ravensbank, would be nearly streight; and, in an uninterrupted descent, would pass between Bowstead and Drumburgh hills:—the distance would be about three miles and a half; and the fall to high water spring tides, about thirty eight feet, and to *half tide* from the level of the ocean,* about fifteen feet more.

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* Not from the low water of the Firth because its channel lies higher, than the level of low water at sea.

The fall to Bowness will be the same; and the line to Knock-Cross, (the nearest discharging place to Bowness) will run on the west side of Drumburgh Hill:—it will be nearly straight, and in favourable ground; and the distance about five and a half miles.—The distance from the same point to Maryport, by the Canal will be nearly twenty-two miles: therefore, the saving in point of distance, would only be about sixteen miles and a half; which, in general, would be more than compensated for, by the difference of sea freight, and the other reasons advanced in my first report.

A line to Sandsfield, should it ever be deemed necessary, might go off from the S. W. end of Monkhill; without any impediment the whole way, from irregularity of ground. The distance would be less than two miles and a quarter; but the fall would be two locks more than to Ravensbank, or to Bowness; *on account of the different level departed from.*—The point of departure is nearly twenty-five miles from Maryport; so that the saving, in regard to distance, would be considerable; and, of some moment, were the sea freights nearly equal; or the quantity of commerce to Sandsfield sufficient to demand a Canal.—When at this place, I enquired particularly into the recourse

recourse of vessels to it; and was informed that there were three, regularly in the trade of an average burthen not exceeding Thirtyfive tons; and that they usually made seven voyages each (mostly from Liverpool)—that very few accidental vessels came; and that they, with the occasional outward cargoes of the others, did not exceed one half of what was brought inwards:—therefore, the whole quantity of tonnage, both ways, does not exceed a thousand tons annually; the *whole* land carriage of which, for two and a quarter miles; if paid as toll, in lieu of a small portion of the saving between land and water carriage; would fall short of paying the interest of the money necessary to be expended in forming the Canal; setting lock-keepers and repairs out of the question. Consequently, as there is no sufficient prospect of increase of carriage; the propriety of executing that line falls to the ground.—The same argument holds; but, in a lesser degree, against another plan that could be easier carried into effect.—From the Canal, after passing the north side of the hill of Kirkandrews, a branch on the *same level*, and of little more than three quarters of a mile in length, might be taken to the summit of the scar at the east end of Beaumont; at the foot
of

of which, the Eden is very deep; and high tides flow there several feet: therefore, if the navigation of the river was improved, that far, for such vessels as come to Sandsfield, the cargoes might easily be changed from the vessels to the boats, or from the boats to the vessels, by means of simple machinery moved by the waste water of the Canal.

Having, now, said every thing material that occurs to me on the practicability, or propriety, of the various proposed branches to Solway Firth; I shall resume the line to Maryport, from the westward of little Banton.—At this place it had fallen two locks from Carlisle; and, to enable it to pass the flat vale of the Wampool, it becomes necessary to fall two* more on the side of Banton Beck, *in a course towards the western extremity* of the high ground from Ake-ton, fronting the village of Biglands; and the line, thence, passing forward to the *points of the ridges of high land abutting upon the S. E. of Bigland Marsh*, will go to the N. W. end of the high land of Gamblesby; and across the Wampool to the foot of Eskrigg.—The distance across the vale is nearly half a mile; and the embankment about eleven to twelve feet.—

There

*In all about thirty seven feet from Carlisle.

There will be nearly the same in crossing the outlets of the valleys on the S. E. of Bigland marsh; which cannot be avoided; because the irregularity of the ground more to the eastward, between Banton Beck and the ridge of Gamblesby, is such as to render the full descent eligible, so far as relates to the simple continuance of the line.—The irregularity mentioned, consists of a number of insulated hills; but by passing to the north, and to the eastward of them; a line close under the town of Aketon, might be brought from above the last descending lock* to enter the vale of Wampool a little above Moorhouse-Mill, and go up the vale of the Wiza to near Dockray; should the trade of Wigton require it: but, unless they brought it to the foot of the town, which would require at least two locks more, and be attended with some more expence in forming reservoirs† for a supply of water, this extension will be the less eligible;

This lock; as a branch may at some period be carried to Wigton: should, to provide for that event, be brought nearly half a mile more forward, to the southern extremity of the western face of the highland, between Aketon and Banton-Beck: which will only be attended with a little additional expence in passing that rivulet:—then, by about two and a half miles of easily executed Canal, *a navigation upon the same level with the main Canal*, may be brought within less than a mile and a half off the town of Wigton.

†This would be requisite because the usual current of the adjacent streams is occupied by mills.

eligible; because the line to Maryport passes, on the north side to Eskrigg, within three and a quarter miles off Wigton: and, beyond Lefson-Hall, is not much further distant.

Many of the gentlemen of Wigton, and other places, being extremely desirous *that the Canal should pass by Dalston and Caldew Mire*, in place of going northward from Carlisle, by Kirkan-drews; I thought it necessary to ascertain the height of the summit between the Caldew and head of the Wampool; as it would, not only put beyond a doubt the impropriety of that course; but shew the probable height that would be, at any time, requisite to rise from the Canal (as now laid out) *to obtain the heavy products of the head of Wampool or Chalk-Beck**.

The ground from the Caldew, opposite Dalston, to the head of the Wampool above Caldew Mire, is remarkably flat; but the rise of the Caldew is such as would, with some deep cutting in the summit, require a rise from the Carlisle level of fifty feet (say of five locks):—
therefore

*On Chalk-Beck there are remarkably fine quarries of reddish free-stone, in strata of all requisite thickneses: similar, if not superior, to those on the Gelt; which are of the less consequence, as the latter will be easily attainable.

therefore, as the Eden cannot, without deviating far from the regular course, be passed on such a height as would accord* with this passage to Caldew Mire; it follows that to carry the Maryport line, this way, there would be required *an ascent of five locks*; and a similar *descent of five more, to regain the level that was left*.—Besides; after incurring this expence, and unnecessary delay to all the commerce, where would the water be had to give two lock fulls for every boat that should pass this second summit; *as all the streams are fully occupied by mills?*—It has been said that in this case *the line would go to Wigton*; but that would never be: because the line could not advance forward:—the ground between Wigton and Waver Bridge, which is the lowest pass, being far too high for that purpose:—therefore, the sole advantage to Wigton would be a branch without a lock; which might be effected, by the main Canal, in its course from Caldew-Mire, keeping sufficient elevation on the west bank of the vale of Wampool, above the entrance of the Wiza.—It therefore evidently appears, from what has been before advanced, that, so far as Wigton is the object, it may be

E equally

* If this were practible without deviation of course, it would still require *five locks to make a communication with Carlisle.*

equally benefited without departing from the obviously proper course for the main Canal.

From the eastern side of Eskrigg, where the Canal joins it after crossing the Wampool, it will pass in front of the northern declivity of that hill; and, coursing round to the south of Wedholm, it goes northward on the west side of the bog west of Wedholm; and, after crossing the two arms of the Waver, about half a mile north of Lesson-Hall; it goes south of Kelsick, and of the boggy ground S. W. of it; and, at the foot of the rising ground, passes the high road from Wigton to Abbey Holm; nearly a mile and a half from the latter place. Then, the line, after passing some inclosed ground, enters the High Holm Mire; and keeping on the southern side of it, for about a mile; crosses obliquely to an insulated piece of high ground, west of Souterfield village, and S. E. of Aldoth.—In its passage across the mire, there is about half a mile of ten or eleven feet embanking.—The line, then, courses the south side of the high ground mentioned; and passing nearly a quarter of a mile south of the high land under the Windmill on the Holm-Hards, goes streight through the Bog, and through the narrow pass between Mealrigg and Coupar; then turning southward, to avoid a point

point of the Holm-Hards, it comes into the ground in which the rivulet runs from Whinbank to Dub Mill; and there again falls into level cutting; which it lost at rather more than a quarter of a mile east of the high road, north from Mealrigg, towards Aldoth.—The height of the deep cutting is on each side of the road; and is there, eight or nine feet beyond the depth of the Canal.—It averages about six feet extra-depth, for a mile and a quarter; but, as the whole depth is mostly in a moss, or a peat soil; the extraordinary expence will be less considerable.—From the place last described, nearly half a mile S. W. of Coupar, the line goes north of Howrigg; and passing by the west end of Brownrigg, it comes to where two lines may be pursued; each of which have their respective advantages.

The one line passes the south end of Allonby-Grigg, a little to the north of Bowscals; and then, near the rivulet, falls eleven or twelve feet:—from the foot of this lock, a level branch may be run to Alonby, which is only three furlongs distant; and, from the lock, to Maryport, there would be one continued level in the following line, (viz) west of Crookhurst, and the Blue Dial; and, east of Meala-House, and Low-Mire; then, passing

E 2
through

through the Bog on the south side of Swartha, and north of Canonby-Brownrigg; it will go by the bank end, north of the hill of Valentia, past the quarries, and behind the Tan-House; then, crossing in front of the Cotton Mill, it may terminate in a *Bafon* east of the Ship-Yard.—And, from this bafon, if a ships width be taken off the shipbuilders yard; vessels, *with only the north Pier between*, may have a communication to load, or unload, to or from the Canal.—The level of the bafon will be about seven feet above the level of spring tides; and, the boats may, from thence, lock down into the north harbour; as *some of a stronger construction may occasionally* run to Workington; or, perhaps to Whitehaven.—The spare water of the Canal, at the extremity, may be applied to various obvious purposes; and, occasionally, to fluice out the north harbour.

The other line, yet undescribed, from beyond Allonby, would run about one hundred yards east of Bow-scales;*and, crossing the valley to the foot of of the high land under Meala-Grigg; would, opposite Low-Mire, draw near the one described; and keeping the higher land
very

* A line might from thence pass, on one level, to the west side of the Grigg; and within less than a quarter of a mile of Allonby. The commerce of this place in cured Herrings, is sometimes very considerable.

very near the same course, would continue *the Wampool level* to as far as Bank-End: from whence, at some period, it might, *on the same level*, go south of Valentia;† and, after crossing the river Ellen, near Nether Hall, proceed on the low land all the way to Workington.—Had it been possible to have maintained any material elevation, so as to have nearly approached Cockermouth, without locks;—it might have been an object; but as this was totally precluded, by the face of the country, the prospect of any extension to the S. W. dies away:—therefore, as this last described line is, both, more expensive; and less convenient for Alonby; the advantage seems to preponderate in favour of the other.

I have now described, nearly, *the general course of the Canal*; which, although it will admit of improvement, when I have the benefit of consulting with Messrs Jessop, and Whitworth, will not deviate far; and I have no hesitation in asserting, that as this Canal would occupy all the chief passes of the country, it could never be essentially interfered with by rival canals; but, on the other hand

† This vale is so low that the river Ellen, in floods, frequently runs down it, in a considerable stream.

hand, bids fair to be very materially benefited by a number of branches, that ere long, must strike off from it; and add much to the value of the parent Trunk.

When we consider the mountainous aspect of the country on the confines of Northumberland and Cumberland; it will appear a matter of surprise, that the summit of the proposed Canal, should be between thirty and forty feet lower than that between the Trent and Severn, at Smithwick near Birmingham; and (as far as I recollect) above sixty feet lower than the summit, at Colne, of the Canal between Leeds and Liverpool.†

Until the dimensions of the locks, and of the Canal; and its precise course; be determined; I can give no proper estimate; and can only say that the portion of Canal from Carlisle to Maryport, on account of its having a very small number of locks, and no large aqueducts, will cost, in proportion to its extent, very considerably less than the other.

I have hitherto defer'd giving an account of all the distances; as they will be seen more comprehensively by being placed in a table; *
along

* See the end.

† From the level of the sea.

along with the respective rises and falls ; which I cannot vouch for as precisely accurate ; because, I have had no opportunity of proving them, by a return survey : however, I conceive, there is no material error ; as the height of the two seas, at half tide, accorded within two or three feet.

I have endeavoured to give such information as may throw an additional light on a subject, so momentous to these northern counties, and to the kingdom at large : and, at the same time, have left much unnoticed, as to the species and quantity of commerce ; knowing that gentlemen resident in different parts of the country, and possessed of local information, will, easily and more perfectly, fill up the deficiencies.

I am,

GENTLEMEN,

Your humble servant,

WILLIAM CHAPMAN.

Newcastle July 10th, 1795

26 FEB 66

COMMITTEE OF AND SUBSCRIBERS TO THE SURVEY
TROUGH NORTHUMBERLAND AND CUMBERLAND.

A TABLE

A T A B L E

OF THE APPROXIMATE
DISTANCES and HEIGHTS,
ON THE PROPOSED NAVIGATION BETWEEN
Newcastle and Maryport.

	Distance.		Total dist.		Rise. T. Rise.	
	M.	F.	M.	F.	Feet.	Feet.
Half rise of spring tides	-	-	-	-	- 9	
Spring tide height to commence- ment on the north side of NEWCASTLE, lay to the West- gate road					196	205
WALLBOTTLE - - - - -	5	5				
THROCKLEY - - - - -	1	2	6	7		
Lane south from HEDDON Fur. } on the WALL* - - - (3) }	-	-	-	-		
Lane from west end of WYLAM (5)	2	-	9	4		
Lane N. E. from HORSELY (6)	-	7	10	3		
Lane north from Ovingham (5)	-	7	11	2		
OVINGTON - - - - -	1	5	12	7		
Lane north from BYWELL (6)	1	5	14	2		
Lane south from NEWTON (4)	1	1	15	3		
STYFORD Lane.—From river Tyne	-	-	-	-		
(2)	1	2	16	5		
CORBRIDGE Bafon (1½)	2	2	18	7		
ANICK - - - - - (½)	3	2	22	1		
HEXHAM north road, from Tyne } bridge - - - (nearly 3) }	-	-	-	-		
	-	5	22	6		
ACOMB - - - - -	1	5	24	1		
North Tyne aqueduct - - -	-	7	25	-		
Netherwarden - - - - -	-	4	25	4		
Newbrugh - - - - - (2½)	2	6	28	2		
HAYDON BRIDGE, ——— (From the Bridge 1½)	-	-	-	-		
	2	4	30	6		
Ridley-Hall Bridge - - - -	2	7	33	5	100	305
Bardon Mills - - - - -	1	1	34	6	Level.	305
Milkridge - - - - -	2	6	37	4	40	345
HALTWESEL (opposite the church)	2	-	39	4	20	365
Commencement of the summit level	1	2	40	6	80	445
GLENWHELT - - - - -	2	1	42	7		
Mups Hall - - - - -	2	5	45	2		
Upper Denton - - - - -	1	3	46	5		
Road to Naworth Castle - - -	4	2	50	7		
West end of summit level and se- } paration of line to Penrith &c. }	-	-	-	-		
	1	4	52	3		
Penrith line to Castle Carrick	3	3	55	6		

† This distance will be more or less according to where the river Tyne is locked down into.

* The distance between () are from the line of Canal, to the respective towns.

T A B L E

CONTINUED FROM THE

SUMMIT LEVEL,

W E S T W A R D.

	Distance.		Total dist.		Fall. T. fall	
	M.	F.	M.	F.	Feet.	Feet.
West end of summit level M. F.	-	-	52	3		
BRAMPTON from Hollas House (10)	1	1	53	4	57	
GELT-BRIDGE. (From the present	-	-	-	-		
quarries 06)	1	-	54	4	106	253
HAYTON - - - - (03)	1	2	55	6	10	263
AQUEDUCT over the EDEN - -	2	2	58	-	111	274
CARLISLE, at St Nicholas (branch	-	-	-	-		
03½)	4	6	62	6	} Level.	374
Bason opposite Caldew-gate (01)	1	6	64	4		
KIRKANDREWS - - - (01)	2	2	66	6		
Separation for Sandsfield - -	2	-	68	6		
Thrustfield Lock - - - -	1	3	70	1		
Separation below Kirkbanton Lock	-	-	-	-		
to Ravensbank or Bowefs - -	1	4	71	5	18	392
LITTLE-BANTON - - - (02)	1	5	73	2	} Level.	401
Separation to WIGTON (as mention-	-	-	-	-		
ed in note page 33) - - -	1	6	75	-	9	401
GAMBLESBY - - - -	-	5	75	5	10	411
Road from Eskrigg to Kirkbride	-	-	-	-		
(from Wigton 32)	-	7	76	4	} Level.	411
Road from Wigton to Abbey-Holm	-	-	-	-		
(from the Abbey 14)	4	1	80	5		
COUFAR - - - -	4	3	85	-		
ALLONBY (Road to Wigton) - -	3	3	88	3	12	423
Separation to Allonby - (04)	-	1	88	4	} Level.	430
MARYPORT BASON - - - -	5	-	93	4		
Top of spring tides - - -					7	430
Half tide - - - -					15	445

F I N I S.

Errata,

In the *first part* of this Report.

Page 15 line 4 from the bottom "*many*" in place of "*may*."

Page 16 line 7 "*the influence*" &c. down to the word "*obtained*" was a note to the word "*extremity*" in the first line of that page :—but, from the accidental circumstance of "*and*" being the *last of the text* in a page of the *Manuscript* ; the interpolation, of the note, between the words "*and*" and "*home*" took place in the hurry of printing.

26 FEB 66